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Indian Standard

METHODS OF TEST FOR PULP

PART XVII DETERMINATION OF SALEABLE MASS OF PULP

UDC 676.1 : 676.017.25

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Indian Standard

METHODS OF TEST FOR PULP

PART XVII DETERMINATION OF SALEABLE MASS OF PULP

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Indian Standard

METHODS OF TEST FOR PULP

PART XVII DETERMINATION OF SALEABLE MASS OF PULP

0. FOREWORD

0.1 This Indian Standard (Part XVII) was adopted by the Indian Standards Institution on 20 November 1978, after the draft finalized by the Paper and Its Products (Excluding Packaging Materials) Sectional Committee had been approved by the Chemical Division Council.

0.2 This standard caters to flash-dried baled pulp only. Flash-dried baled pulp is usually manufactured with about 25 percent moisture in pulp. Under Indian conditions, a moisture gradient occurs in various areas of the slabs comprising the bale. However, the saleable mass of the bale remains constant as it is computed on the basis of oven-dry mass of the pulp and the commercial dryness.

0.3 In preparing this standard considerable assistance has been derived from the data made available by M/s Central Pulp Mills Ltd, Songadh, based on experiments conducted in their research laboratory. The assistance so derived is thankfully acknowledged.

0.4 This method consists of dividing the area of the slab (of the bale) into rectangles, so as to give portions of equal area. An actual example of calculating the dimensions of the rectangles has been given in Appendix A.

0.5 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part XVII) prescribes the method for determining the saleable mass of flash-dried baled pulp.

2. TERMINOLOGY

2.0 For the purpose of this standard, following definitions shall apply.

---

*Rules for rounding off numerical values *(revised)*.

2.1 Lot — The total number of bales of the same sort ??? pulp ??? specific characteristics. The number of bales comprising the lot is ??? agreed to between the purchaser and the supplier.

2.2 Gross Mass — The total mass of a bale, a part ??? a lot, a lot, comprising contents, wrappers and packaging wires or strappings.

2.3 Oven-Dry Mass – The constant mass obtained on drying the pulp test pieces at a temperature of 105 ± 2°C.

2.4 Absolute Dryness — The ratio of the oven-dry mass of the pulp to its initial mass, expressed as percentage.

2.5 Commercial Dryness — Commercially a conventional equilibrium value has ??? accepted which is the commercial dryness. It is 1.11 times that ??? dry mass.

2.6 Saleable Mass — The gross mass multiplied by the absolute dryness multiplied by the ??? commercial dryness, usually called air-dry mass.

3. APPARATUS

3.1 Weighing Scale — For weighing pulp bales the accuracy of which shall be ± 0.5 kg.

3.2 Analytical Balance — For weighing pulp samples with an accuracy of 0.001 g.

3.3 Drying Oven — With good ventilation and capable of regulation to 105 ± 2°C.

3.4 Suitable Equipment to Chisel or Bore the Slab

3.5 Template

4. SAMPLING OF BALES

4.1 The number bales for testing shall taken as given in Appendix B.

4.2 After fixing the sample number ??? specified in **4.1**, the bales for sampling shall selected at random from the lot and in order to ensure randomness of selection, procedures given in IS : 4905-1968* shall ??? followed.

4.3 The accuracy a determination or test is dependent upon the taking of representative samples. The samples shall drawn only from sound, intact and undamaged bales from different sections ??? the lot. Bales previously sampled shall not ??? considered ??? or intact. Bales whose gross mass differs from the original gross mass, as per the supplier's invoice, by more than 10 percent, also shall not be considered as sound or intact. No unusual condition shall prevail in the selection of bales.

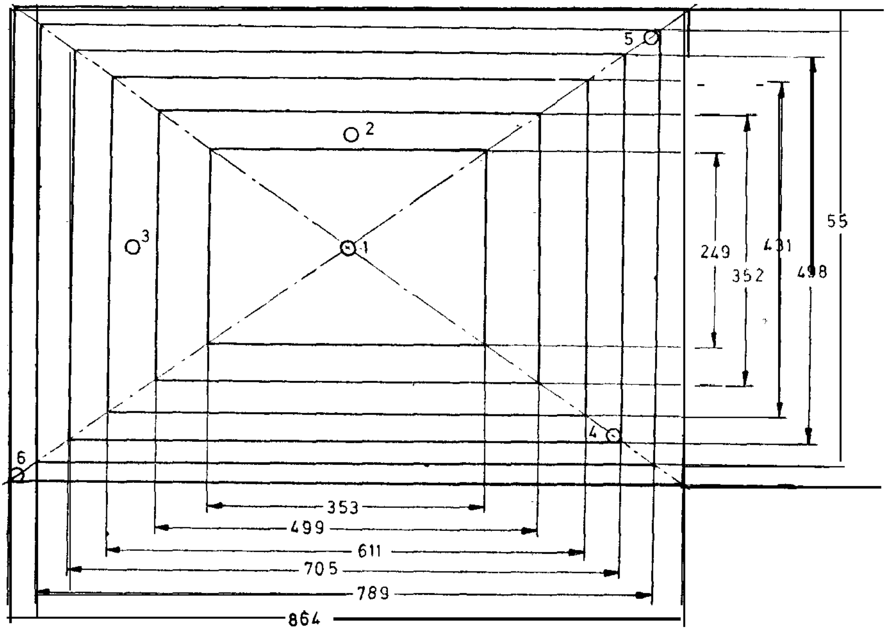
---

*Methods for random sampling.

5. PROCEDURE

5.1 Determine the gross mass of each sampled bale separately and record it to the nearest 0.5 kg.

5.2 Cut the wires and other wrappings covering the bales. Divide each slab into six equal areas as shown in Fig. 1, the outer three areas consisting of half the pulp mass (OD) in the slab and the inner three areas making up the other half.



All dimensions in millimetres.

FIG. 1 SIDES OF RECTANGLES FOR DIVIDING THE PULP SLAB SIX EQUAL AREAS

5.3 Collect the pulp samples separately from each area of each slab by chiseling or boring all the way through a uniform diameter hole into the slab. Transfer the entire sample to an air-tight polyethylene bag and close tightly. Keep the samples so collected individually in an oven at 105 ± 2°C until the mass is constant. Care shall taken to ensure that the pulp samples collected ??? are of equal or nearly equal mass, for example ??? hundred grams.

5.4 From the initial mass and oven dry mass of each pulp sample, determine the moisture content of each area of the slab. From this determine the average pulp moisture content ??? the slab. Then determine the average pulp moisture content ??? the bale from the average moisture content of the various slabs comprising the bale.

6. CALCULATION AND REPORT

6.1 The saleable mass pulp in the consignment is determined as follows:

$$M = \frac{1{\cdot}11\ (m_1x_1 + m_2x_2 + m_3x_3 \cdots + m_nx_n)\ \times N}{n}$$

where

$m_1, m_2, m_3 \ldots\ldots m_n$??? the gross mass in kg of the bales sampled;

$x_1, x_2, x_3 \ldots\ldots x_n$??? the absolute (oven dryness, that is $\frac{(100 - \text{moisture})}{100}$ values for the bales sampled;

n = number of bales sampled;

N = total number ??? bales in the pulp consignment;

1.]] = factor to convert absolute (oven) dryness to commercial (air) dryness;

M = total saleable mass (air dry mass) ??? the pulp in the consignment (*see also* Appendix C for illustrative example of calculations).

6.2 Report the saleable mass of the pulp lot to the nearest kg. Report any out of the ordinary details of procedure, as well as any not provided for in this standard, and ??? incidents that may have affected the results. A typical form ??? for reporting the results is given in Appendix D.

6.3 In case ??? dispute, a retest shall ??? made either by one approved analyst acting for and mutually agreed by both the purchaser and the supplier, ??? a joint test shall ??? made by approved analysts representing both, ??? mutually agreed by them. In case of a joint test, both analysts ??? their authorized representatives shall ??? present during the sampling and weighing ??? subsequent testing of samples, but only one set or samples shall be obtained from the bales weighed and these samples shall be dried in an oven approved by both analysts. Retests coming within 1 percent of the original saleable mass ??? pulp as invoiced shall ??? deemed to uphold the original invoice.

6.4 Retests shall not made on pulp which has ??? unduly ??? to the weather or other unusual conditions of moisture of heat, except when agreed to between the purchaser ??? the supplier.

6.5 Whenever possible, in all cases of dispute, the lot shall ??? kept intact. In no case shall there ??? less than 50 percent of the lot presented for retests,

APPENDIX A

(*Clause* 0.4)

ILLUSTRATION SHOWING DIVISION OF THE PULP SLAB INTO SIX EQUAL AREAS

A-1. DETAILS OF CALCULATION

Let the size of the slab 61×86.4 cm

Area of the slab $61 \times 86.4\ \text{cm}^2 = 5 \quad 4\ \text{cm}^2$

The slab is divided into six equal areas, each area representing 1/6 of the pulp mass in the slab, as shown in Fig. 1.

Therefore, area of each portion $5\ 270.4/6 \quad 878.4\ \text{cm}^2$ (*see* Fig. 1).

Now the dimensions of the smallest rectangale *1* are given as:

$$l_1 \times b_1 = 878.4\ \text{cm}^2$$

and $$\frac{l_1}{b_1} = \frac{86{\cdot}4}{61}$$

where

l_1 = length in cm of the rectangle smallest in size, and

b_1 = breadth in cm of the rectangle smallest in size.

Therefore, $$\frac{b_1 \times 86{\cdot}4}{61} \times b_1 = 878{\cdot}4\ \text{cm}^2$$

Therefore, $b_1 = 24.9$ cm and $l_1 = 35.3$ cm

The dimensions of the innermost rectangle are 24.9 × 35.3 cm. Similarly, the dimensions of the other rectangles of the slab can be calculated, so as to give portions of equal area, as follows:

$$\frac{b_2 \times 86{\cdot}4}{61} \times b_2 = 2 \times 878{\cdot}4\ \text{cm}^2$$

$$\frac{b_3 \times 86{\cdot}4}{61} \times b_3 = 3 \times 878{\cdot}4 \text{ cm}^2$$

$$\frac{b_4 \; x \; 86{\cdot}4}{61} \times b^4 = 4 \times 878{\cdot}4 \text{ cm}^2$$

$$\frac{b_5 \times 86{\cdot}4}{61} \times b_5 = 5 \text{ x } 878{\cdot}4 \text{ cm}^2$$

where, b_2, b_3, b_4 and b_5 are breadths of rectangle No. 2, 3, 4 and 5 respectively.

The dimensions of the various rectangles thus calculated are:

No. 1 (innermost) = 24.9 × 35.3 cm
No. 2 = 35.2 × 49.9 cm
No. 3 = 43.1 × 61.1 cm
No. 4 = 49.8 × 70.5 cm
No. 5 = 55.7 × 78.9 cm
No. 6 (outermost) = 61.0 × 86.4 cm

APPENDIX B

(*Clause* 4.1)

NUMBER OF BALES TO BE SAMPLED

Total Number of Bales in the Lot	*Number of Sample Bales*	
(1)	(2)	(3)
up to 100	12	24
101 „ 200	18	36
201 „ 300	24	48
301 „ 400		48
401 „ 500	24	48
501 „ 600	30	60
601 „ 700	30	60
701 „ 800	36	72
801 „ 900	36	72
901 „ 1000	42	84
1 001 „ 2 000	48	96
2001 „ 3 000	72	120
3 001 „ 4000		144
4001 „ 5000	96	192

Above 5 000, the minimum number to -be sampled is 100 plus one percent of the bales in excess of 5 000, the maximum number to be sampled is 200 plus one percent of the bales in excess of 5 000.

APPENDIX C

(Clause 6.1)

EXAMPLE OF CALCULATION

Calculation : $$M = \frac{1{\cdot}11\,(m_1 x_1 + m_2 x_2 + m_3 x_3 \cdots\cdots + m_n x_n)}{n} \times N$$

where

$N = 200$

$n = 18$

$$\therefore M = \left\{ \frac{1{\cdot}11 \left[(199{\cdot}5 \times 0{\cdot}845) + (190{\cdot}0 \times 0{\cdot}862) + (195 \times 0.885) + (194 \times 0{\cdot}863) + (190.5 \times 0{\cdot}85) + (199 \times 0{\cdot}871) + (191{\cdot}5 \times 0{\cdot}851) + (200 \times 0{\cdot}87) + (190 \times 0{\cdot}85) + (198{\cdot}5 \times 0.844) + (190{\cdot}5 \times 0{\cdot}886) + (198 \times 0{\cdot}895) + (192 \times 0.85) + (197 \times 0{\cdot}82) + (200 \times 0{\cdot}87) + (201 \times 0{,}867) + (198 \times 0{\cdot}831) + (190 \times 0{\cdot}85) \right] \times 200}{18} \right|$$

$= 37\ 274.6$ kg

As per invoice, gross mass in kg = 41 501.0

As per invoice, air dry mass in kg = 37 388.0

As per test, air dry mass in kg = 37 274.6

Difference, percent = -0.30

APPENDIX D

(*Clause* 6.2)

TYPICAL REPORT FORM

i) Pulp quality : Unbleached/bleached/semi-bleached bamboo/softwood

ii) Stored at :

iii) Method of storage : Enclosed/Open space

iv) Name and address of manufacturer :

v) Challan No.

vi) Method of transport :

vii) Date of sampling :

viii) Place of sampling :

ix) Number of bales available before testing (approx) :

x) State of bales :

xi) Number of bales sampled :

xii) Total number of bales in the lot :

xiii) Calculated oven dry mass of sampled bales :

xiv) Saleable mass of bales of pulp in lot according to invoicing :

xv) Saleable mass of the baled pulp in the lot as per test :

xvi) Percentage shortage or : excess

Remarks, if any :

NOTE — Details of sample bales and test piece.

Date: Tested by:

Place:

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METHODS OF TEST FOR PAPER AND ALLIED PRODUCTS

IS:

1060 (Part I)-1966 Methods of sampling and test for paper and allied products, Part I (*revised*)
1060 (Part II)-1960 Methods of sampling and test for paper and allied products, Part II (*revised*)
1060 (Part III)-1960 Methods of sampling and test for paper and allied products, Part III
2188-1962 Methods of test for paper for electrical purpose
4006 (Part I)-1966 Methods of test for paper and pulp based packaging materials, Part I
4006 (Part II)-1972 Methods of test for paper and pulp based packaging materials, Part II
5285-1969 Methods of test for fibre analysis of paper and board
6213 Methods of test for pulp:
- (Part I)-1971 Water solubility of pulp
- (Part II)-1971 Determination of freeness of pulp
- (Part III)-1971 Determination of alpha, beta and gamma cellulose in pulp
- (Part IV)-1971 Determination of viscosity of pulp
- (Part V)-1971 Solubility of pulp in one percent caustic soda solution
- (Part VI)-1971 Copper number of pulp
- (Part VII)-1971 Ash in pulp
- (Part VIII)-1973 Beating, sheet making preparation of hard sheets and testing
- (Part IX)-1973 Bleach requirement and preparation of hard sheets for optical tests of pulp
- (Part X)-1975 Determination of the kappa number of pulp
- (Part XI)-1975 Determination of acid insoluble ash
- (Part XII)-1975 Determination of calcium content
- (Part XIII)-1975 Determination of copper
- (Part XIV)-1975 Determination of iron
- (Part XV)-1975 Determination of manganese
- (Part XVI)-1978 Dirt count
- (Part XVII)-1978 Determination of saleable mass of pulp

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